

AD-A155 295 CAST (IRON) REINFORCING CAGE FOR ELEMENTS FOR LINING  
TUNNELS AND THE LIKE. (U) FOREIGN TECHNOLOGY DIV  
WRIGHT-PATTERSON AFB OH O S RAYNUS ET AL. 08 APR 85

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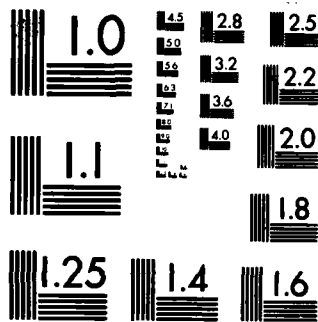
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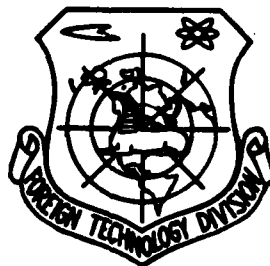
## FOREIGN TECHNOLOGY DIVISION



CAST (IRON) REINFORCING CAGE FOR ELEMENTS FOR LINING  
TUNNELS, AND THE LIKE, OF STRUCTURES WITH A ROUND CROSS  
SECTION

By

O. S. Raynus, P. I. Bokenoz, et al.



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# **EDITED TRANSLATION**

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8 April 1985

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By: O. S. Raynus, P. I. Bokenoz, et al.

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PREPARED BY:

TRANSLATION DIVISION  
FOREIGN TECHNOLOGY DIVISION  
WP-AFB, OHIO.

# U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З э	<i>З э</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ё in Russian, transliterate as yě or ě.

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh <sup>-1</sup>
cos	cos	ch	cosh	arc ch	cosh <sup>-1</sup>
tg	tan	th	tanh	arc th	tann <sup>-1</sup>
ctg	cot	cth	coth	arc cth	coth <sup>-1</sup>
sec	sec	sch	sech	arc sch	sech <sup>-1</sup>
cosec	csc	csch	csch	arc csch	csch <sup>-1</sup>

Russian English

rot curl  
lg log

## GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

## **CAST (IRON) REINFORCING CAGE FOR ELEMENTS FOR LINING TUNNELS, AND THE LIKE, OF STRUCTURES WITH A ROUND CROSS SECTION**

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Presented on 21 April 1958 as No. 597796 to the Committee on Inventions and Discoveries of the Council of Ministers USSR

We know of cast reinforcing cages consisting of flat frameworks which are joined by welding the protruding parts, and their precise positioning in the structure is provided by using gages.

A highly skilled work force is needed to perform these operations.

In the cage described below, this drawback is eliminated by making the flat cages with bosses for providing precise positioning during assembly, and they are locked together when they (the flat frameworks) are combined into the cage of the lining element.

This design does not require the installers to be highly skilled, and it makes it possible to rapidly assemble the cages with a small expenditure of the work force.

Figure 1 shows a rough picture of the cage in the assembled form; it has been placed in forms before being set in concrete. Figure 2 shows a detailed view of the end part of the cage on an enlarged scale.

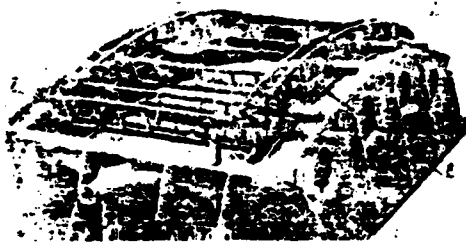


Fig. 1.

According to the invention, the cast reinforcing cage 1 (Fig. 1 and 2) is made from flat cast iron frameworks placed both over the contour of the block in the annular 2 and radial 3 directions, and inside it 4. All of the flat frameworks: 2, 3, 4 are trusses consisting of chords 5 and a grid made up of struts 6.

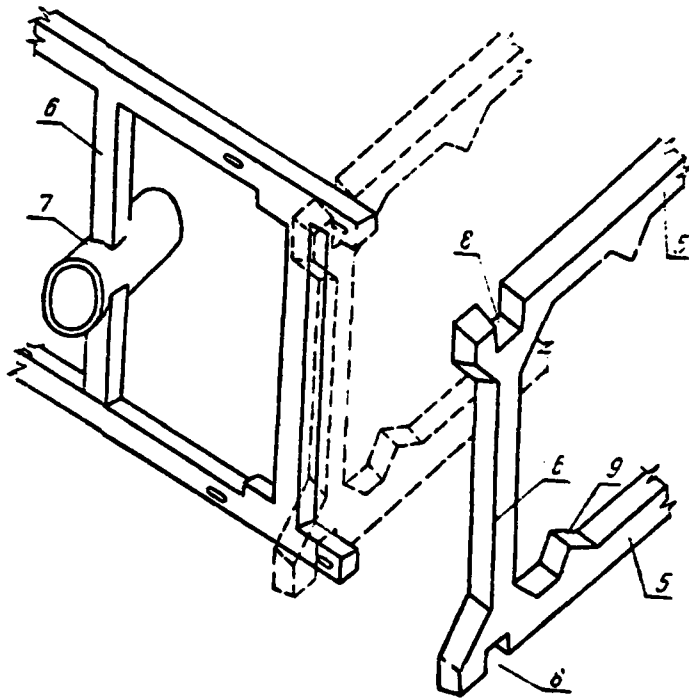


Fig. 2.

The closed form of the cages makes it possible to transfer the forces from the working reinforcement to the concrete, which makes it unnecessary to install anchoring rods.

Holes 7 are made in the cage struts during lining for the assembly couplings. When joined into the cage of a lining element, the flat frameworks are locked together. Their chords have notches 8 for this purpose.

The frameworks, which are installed in the circular direction 2, have beveled bosses 9 on the inner surfaces of the chords; the frameworks installed in the radial direction rest on these bosses.

The above bosses make it possible to precisely fasten down the flat frameworks in the desired position.

### Subject of Invention

This invention is a cast (iron) reinforcing cage for the lining elements of tunnels, etc., of structures with a round cross section and which are assembled from flat frameworks. It differs because in order to decrease the labor consumption of installation, the flat frameworks have bosses to provide precise positioning during assembly, and they are locked together when they are joined into the cage of the tunnel lining element. (Transl. No. 11111)



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